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SYNOPSIS OF THE VOLES OF THE GENUS
PHENACOMYS.

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With the possible exception of some bones and teeth found in a cave in southern Hungary and described by Nehring in 1883, no specimens of voles of the genus *Phenacomys* were brought to notice until about eight years ago. In October, 1889, Dr. C. Hart Merriam first defined the genus and described four specimens, two from Labrador, one from Quebec, and one from British Columbia, each of which he made the type of a new species. In 1890 Mr. F. W. True described a fifth species from Oregon. A year later Dr. Merriam discovered still another in Idaho. In 1894 Dr. J. A. Allen described a seventh form supposed to be from the Black Hills of South Dakota. During the following year Mr. S. N. Rhoads named an eighth from British Columbia. Finally, Dr. Merriam has recently described a ninth species from Colorado. In addition to these descriptions of new species, several minor references to the genus have been published. Of these the most important is that by Nehring, in which the remains from the cave in southern Hungary, already referred to, are determined as those of *Phenacomys*.*

As might be inferred from this summary, the material by which the genus is represented in collections has greatly increased since the first specimens were described. Now there are not far from

* Full references to all these papers are given in the bibliography at the end of this article.

one hundred well-prepared skins available for examination.* This material shows that, of the nine described forms, the following six are valid:

<i>Name.</i>	<i>Type locality.</i>
<i>P. intermedius</i> Merriam.....	Kamloops, British Columbia.
<i>P. orophilus</i> Merriam.....	Salmon River Mountains, Idaho.
<i>P. preblei</i> Merriam.....	Longs Peak, Colorado.
<i>P. latimanus</i> Merriam.....	Fort Chimo, Ungava, Labrador.
<i>P. ungava</i> Merriam.....	Fort Chimo, Ungava, Labrador.
<i>P. longicaudus</i> True.....	Marshfield, Coos County, Oregon.

These fall naturally into three groups, each of which occupies a different geographic region. The *ungava* group, containing two well-marked yellow-faced species, *ungava* and *latimanus*, ranges from Quebec and Labrador west at least as far as the north shore of Lake Superior. The *intermedius* group, with three slightly differentiated uniformly grayish or ochraceous species, *intermedius*, *orophilus*, and *preblei*, occupies the mountains of British Columbia, Alberta, and the northwestern United States. The third or *longicaudus* group is represented by one species only, the very aberrant *P. longicaudus* of the humid coast district of Oregon.

The species of *Phenacomys* are voles of medium or small size. With the exception of *P. longicaudus*, which is remarkable for its very long tail, there is nothing in the external appearance of any to distinguish them from small species of *Microtus*. They generally inhabit dry, grassy plains and mountain parks, but *P. longicaudus* appears to be strictly arboreal. At present all the species definitely known are American. The determination of the European fossil remains is open to question.†

*The specimens examined in the present connection are distributed as follows: U. S. National Museum, 64, including the types of *P. longicaudus*, *P. orophilus*, *P. truei*, and *P. preblei* (all but two of these are in the Biological Survey collection); Museum of the Canadian Geological and Natural History Survey, 1 (type of *P. intermedius*); Merriam collection, 3 (types of *P. celatus*, *P. ungava*, and *P. latimanus*); Bangs collection, 16 *P. ungava* from Hamilton Inlet, Labrador; Miller collection, 7 *P. latimanus* from the north shore of Lake Superior, and 4 *P. orophilus* from Mount Baker, British Columbia (topotypes of *P. oramontis*).

† See North American Fauna, No. 12, p. 40.

Genus PHENACOMYS Merriam.

Phenacomys Merriam, North American Fauna, No. 2, p. 28, October 30, 1889.

Type species.—*Phenacomys intermedius* Merriam.

Geographic distribution.—Boreal North America from Atlantic to Pacific, south to the Gulf of Saint Lawrence, the north shore of Lake Superior, the coast of Oregon, and in the Rocky Mountains to Colorado.

Generic characters.—Skull and teeth in general as in *Microtus*, but molars distinctly two-rooted in the adult, and root of lower incisor never reaching level of dental foramen. Reëntrant angles on inner side of lower molars very much deeper than those of outer side, not approximately equal to outer angles as in *Microtus* and *Evotomys*.

Remarks.—*Phenacomys* combines the palate, heavily built angular skull, and strong sharply angled teeth of *Microtus* with the rooted molars and short lower incisors of *Evotomys*. It differs from both *Microtus* and *Evotomys* in the relatively great depth of the inner reëntrant angles of the mandibular molars.

KEY TO THE SPECIES OF PHENACOMYS.

Tail about 40 percent of total length..... *longicaudus*.

Tail about 25 percent of total length.

Face and muzzle reddish or yellowish in strong contrast with rest of head.

Skull of adult with deep frontal sulcus *ungava*.

Skull of adult without frontal sulcus. *latimanus*.

Face and muzzle essentially same color as rest of head.

Ascending branches of premaxillæ broad..... *intermedius*.

Ascending branches of premaxillæ narrow.

Color decidedly ochraceous..... *preblei*.

Color gray..... *orophilus*.

***Phenacomys intermedius* Merriam.**

Phenacomys intermedius Merriam, North American Fauna, No. 2, p. 32, October 30, 1889.

Type locality.—Basaltic plateau about 20 miles NNW. of Kamloops, British Columbia. Altitude 5,500 feet. Type No. 780, Mus. Geol. and Nat Hist. Surv. Canada. Collected by Dr. Geo. M. Dawson.

Geographic distribution.—*Phenacomys intermedius* is known from the type locality only.

General characters.—Size small; general color pale; feet light brown; skull with interorbital region and ascending branches of premaxillæ very broad; front lower molar with five well developed salient angles on outer side.

Color.—Back grizzled grayish brown with a yellowish tinge, everywhere sprinkled with black-tipped hairs which are most numerous on middle of

back and over lumbar region; belly grayish white, the deep plumbeous bases of the hairs showing through; tail sharply bicolor, nearly black above, white beneath; feet light brownish; whiskers mixed blackish and silvery gray.

Skull.—The skull of the type and only known specimen of *Phenacomys intermedius* is so badly broken that many of its characters cannot be ascertained. Enough remains to show two peculiarities which are not shared by any of the numerous skulls of *P. orophilus* with which I have compared it. These are the great breadth of the interorbital region (4 mm. at narrowest part of constriction) and the expanded terminations of the ascending branches of the premaxillæ. The latter character is approached in the type specimen of *P. preblei*. The rostrum appears slightly shorter and deeper than in *P. orophilus*, but this is probably only an optical effect due to the imperfect condition of the nasal bones.

Teeth.—The enamel pattern is essentially the same as that of *P. orophilus*, except that the anterior loop of the front lower molar is so deeply cut by reëntrant angles that a third outer triangle is wholly isolated and a fourth inner triangle is nearly cut off. As a result the transverse loop is reduced to a narrow crescent placed obliquely with the convexity directed forward and outward.

Measurements.—"Total length, about 118; tail vertebræ, 28; hind foot, 18; ear from anterior root, 13 (from dry skin)"—Merriam.

General remarks.—The type specimen of *Phenacomys intermedius*, although imperfect, shows too many differences from any of the other described forms to be united with them. The breadth of the interorbital region is a character of trifling importance, and one which might easily disappear with increasing age, but the great expansion of the ascending branches of the premaxillæ is scarcely to be explained in this way. The peculiarities of the front lower molar are not of a kind likely to be the result of immaturity, and if they are purely individual they represent a degree of variability far in excess of that presented by other known species of the genus. As the skin is now sealed between two glass plates, it is not possible to determine with certainty the character of the fur, but it appears to be less dense and woolly than in *P. orophilus*. In color the type shows no distinct differences from *P. orophilus*, except that the feet are light brown instead of white.

Phenacomys orophilus Merriam.

Phenacomys orophilus Merriam, North American Fauna, No. 5, p. 65, July 30, 1891.

Phenacomys truei Allen, Bull. Am. Mus. Nat. Hist., VI, p. 331, November 7, 1894.

Phenacomys oramontis Rhoads, American Naturalist, XXIX, p. 941, October, 1895.

Type locality.—Salmon River Mountains, Idaho (near head of Timber Creek; altitude, 10,500 feet). Type in U. S. National Museum (♀ adult, No. $\frac{23856}{31256}$).

Geographic distribution.—Hudsonian zone and parts of Canadian zone,

in the mountains of Alberta, British Columbia, and the western United States south to southern Wyoming, central Idaho, and south central Oregon.

General characters.—Size small; fur dense and woolly; general color light gray, somewhat tinged with yellowish; feet nearly white; inter-orbital region of skull narrow and smooth; ascending branches of pre-maxillæ narrow.

Color.—Back grizzled grayish brown, with a yellowish tinge, which is most distinct in spring and summer specimens, the fur everywhere thickly sprinkled with blackish hairs, which, however, do not form a distinct dark dorsal area; face with very few blackish hairs, but not yellower than back; belly dirty white; feet silvery whitish; tail sharply bicolor, pure white below, mixed brown and white above; under fur dark plumbeous, this color showing through irregularly on belly and throat. The young are clearer gray than the adults, but otherwise similar.

Skull.—The skull of *Phenacomys orophilus* is of medium size, that of the type measuring 23.1 mm. in basilar length and 14.2 mm. in zygomatic breadth. The interorbital constriction is narrow, and the frontal ridges, even in very old skulls, are too slightly developed to form a frontal sulcus; ascending branches of premaxillaries narrow and scarcely expanded posteriorly; jugal broadly expanded and mortised into zygomatic process of maxillary.

Teeth.—The enamel pattern shows no distinctive characters as compared with the species of the *ungava* group. The anterior loop of the front lower molar is unusually variable in form, but in the majority of specimens is similar to that of *P. latimanus*.

Measurements.—Type specimen: total length, 146; tail vertebrae, 38; hind foot, 19; average of eight adults from Bear Tooth Mountains, Montana: total length, 146.5; tail vertebrae, 31.8; hind foot, 17.7; average of ten adults from St. Marys Lake, Montana: total length, 141.7; tail vertebrae, 34.5; hind foot, 17.7; average of three adults from type locality of *P. oramontis*: total length, 144.6; tail vertebrae, 37.5; hind foot, 19.3.

Specimens examined.—Total number, 56.

Wyoming: Near Laramie, 1 (type of *P. truei*); Tower Falls, Yellowstone Park, 1.

Montana: Bear Tooth Mountains, 23; Big Snowy Mountains, 1; Midvale, 1; St. Marys Lake, 12; Summit, 1.

Idaho: Salmon River Mountains, 4; Sawtooth City, 2.

Oregon: Blue Mountains (10 miles north of Harney), 1; Crater Lake, 2; Diamond Lake, 1; Mount Hood, 1.

British Columbia: Mount Baker Range, 4 (topotypes of *P. orophilus*).

Alberta: Ninety miles north of Jasper House, 1.

General remarks.—*Phenacomys orophilus* is distinguishable from all other species except *P. intermedius* by its combination of short tail, gray face, and pale color. From *P. intermedius* it differs in cranial and dental characters.

The range of this species is not continuous, but is interrupted wherever the mountains are not high enough to be capped by a Hudsonian area of

sufficient extent. As might be expected, members of the various colonies differ from each other. These differences are, however, too slight to be worthy of recognition by name. The most northerly specimen that I have seen, a female collected at Fishing Lake, Alberta, on September 17, 1896 (No. 81477, U. S. National Museum, Biological Survey collection), has the fur much less thick and woolly than in typical *orophilus*. The feet are brownish as in *P. intermedius*, but in all other characters it agrees perfectly with *orophilus*. Specimens from St. Marys Lake, Montana, average a trifle smaller than those from the type locality.

Since *Phenacomys orophilus* was first described it has received two additional names. The first of these, *P. truei* Allen, was based on the distorted skin and fragmentary skull of a young animal supposed to have been taken in the Black Hills of South Dakota, a region so isolated that if inhabited by the genus it would be expected to furnish a species different from those occurring farther west. The type specimen is, however, exactly like immature *orophilus* in color and in enamel pattern. In size it agrees perfectly except that the tail, in its present condition (a few of the proximal vertebræ removed, the rest dried in the skin), is about 7 millimeters shorter than in fresh specimens of the same age. No weight can be attached to this one difference in the absence of all others. Furthermore, it is practically certain that the type was not collected in the Black Hills of South Dakota, but in the Black Hills of Wyoming, now known as the Laramie Mountains. It was taken on August 10, 1857, by Dr. Hammond, a member of the expedition commanded by Lieut. F. T. Bryan. I have not been able to find any account of the Bryan expedition of 1857 further than the statement, on page 91 of the eleventh volume of the Pacific Railroad Reports, that "the wagon-road expedition under Lieutenant Bryan this year [1857] was confined to routes which he had previously mapped and explored." The map of Bryan's routes shows that he never entered the region now known as the Black Hills, but that his course followed up the Platte River and Lodge Pole Creek through the Laramie Mountains. It is therefore almost beyond doubt that the type of *Phenacomys truei* was collected in Albany County or Laramie County, Wyoming, a few miles northeast of the present town of Laramie. This region is almost continuous with the mountains included in the known range of *orophilus*. *Phenacomys oramontis* Rhoads was based on a specimen from the Mount Baker range in British Columbia, just north of the United States boundary. Four topotypes in my collection are indistinguishable from *P. orophilus*.

***Phenacomys preblei* Merriam.**

Phenacomys preblei Merriam, Proc. Biol. Soc. Washington, X, p. 45, March 16, 1897.

Type locality.—Longs Peak, Colorado. Type in U. S. National Museum (♂ adult, No. 74513), Biological Survey collection.

Geographic distribution.—*Phenacomys preblei* is at present known from the type locality only.

General characters.—Most like *P. orophilus*, but color much more ochraceous and ascending branches of premaxillæ more expanded terminally.

Color.—Dorsal surface clay color suffused with ochraceous, the back thickly sprinkled with black-tipped hairs; feet dirty white; belly yellowish white, the plumbeous under fur showing through irregularly; tail indistinctly bicolor, brownish above, whitish below.

Skull.—The skull is similar to that of *P. orophilus*, but the interorbital ridges are slightly more developed (though not enough to form a median sulcus), the terminal portion of the ascending branch of the premaxilla is broader and the jugal is scarcely mortised into the zygomatic arm of the maxillary.

Teeth.—Not appreciably different from those of *P. orophilus*.

Specimens examined.—One, the type.

General remarks.—*Phenacomys preblei* is closely related to *P. orophilus*, from which it differs in yellower color and some slight cranial characters. In one of the latter it approaches *P. intermedius*.

***Phenacomys latimanus* Merriam.**

Phenacomys latimanus Merriam, North American Fauna No. 2, p. 34, October 30, 1889.

Type locality.—Fort Chimo, Ungava, Labrador.

Geographic distribution.—Arctic and Hudsonian zones from northwestern Labrador to the north shore of Lake Superior. Limits of range not known.

General characters.—Size small; skull never developing sharply defined interorbital ridges, even in extreme old age; muzzle and face conspicuously yellower than rest of head.

Color.—Dorsal surface pale yellowish cinnamon-brown, clearer and more tinged with reddish on muzzle and face; region from eyes to base of tail strongly shaded with blackish hairs; feet and whole ventral surface whitish gray, the throat and belly somewhat darkened by the plumbeous bases of the hairs; no distinct line of demarkation on sides, but color of belly shading abruptly into that of back; tail sharply bicolor, dark brown above, whitish below; ears concolor with surrounding parts, but region immediately behind ear generally paler.

Skull.—The skulls of adult specimens vary in basal length from 20 to 22 mm., and in zygomatic breadth from 13 to 14 mm.; rostrum moderate (nasals contained about three and one-half times in occipito-nasal length) rather more lightly built than in *P. ungava*, and with profile usually more deflected from dorsal outline of frontals; interorbital region faintly concave, never distinctly sulcate.

Teeth.—The enamel pattern of this species calls for no special remark. The anterior loop of the front lower molar is usually cut on the inner side by a deep reëntrant angle, which is so much deeper than that on the outer side as to destroy the bilateral symmetry of the loop. This character occurs in other species, notably *P. orophilus*, but it appears to be more constant in *P. latimanus* than any other.

Measurements.—Type specimen “(from alcoholic before skinning): total length, 116; tail vertebræ, 28; hind foot, 18” (Merriam); seven adults from Peninsula Harbor, Ontario (north shore of Lake Superior), average: total length, 134; tail vertebræ, 29.9; hind foot, 18.1; maximum: total length, 150; tail vertebræ, 38; hind foot, 19.

General remarks.—*Phenacomys latimanus* is recognizable as a member of the *ungava* group by its distinctly fulvous face. From *P. ungava* it differs in its smaller size and smooth interorbital region.

Phenacomys ungava* Merriam.

Phenacomys celatus Merriam, North American Fauna, No. 2, p. 33, October 30, 1889. Godbout, Province of Quebec, Canada (based on old skull, with subquadrate interparietal).

Phenacomys ungava Merriam, North American Fauna, No. 2, p. 35, October 30, 1889. Fort Chimo, Ungava, Labrador (based on young adult skull, with transversely lengthened interparietal).

Type locality.—Fort Chimo, Ungava, Labrador. Type in Merriam collection (♂ adult, No. $\frac{5}{8}\frac{4}{5}\frac{6}{5}$).

Geographic distribution.—Labrador and eastern Quebec. Not known from any point south of the lower edge of the Hudsonian zone.

General characters.—Size large; skull of adult with high interorbital ridges limiting a deep frontal sulcus; muzzle and face conspicuously yellower than rest of head.

Color.—Essentially as in *P. latimanus*; young darker and more plumbeous, at first without the cinnamon of the adult; tail of young specimens nearly uniform dusky, only slightly paler below.

Skull.—The skulls of adult specimens vary in basilar length from 22 to 25 mm. and in zygomatic breadth from 14 to 16 mm. Rostrum rather more heavily built than in *P. latimanus* and with profile usually less deflected from dorsal outline of frontals; interorbital region with two strongly developed ridges, between which lies a conspicuous trough which increases in depth and narrowness in old age.

Teeth.—Except for their larger size, the teeth of *P. ungava* do not differ in any constant character from those of *P. latimanus*. The anterior loop of the front lower molar is, however, less frequently cut by a deep reëntrant angle on the inner side.

Measurements.—Type of *P. ungava* “(from alcoholic specimen before

*I am aware that in the original paper on the genus the specific name *ungava* is printed two pages beyond the name *celatus*. To assume, however, that of alternative names the one which stands first in a book has by virtue of mere position precedence over others is as unreasonable as to assume that the first species mentioned under a composite genus should, other things being equal, necessarily become the type. As priority dates from publication, and publication is distribution, it is impossible for one name to have priority over another issued with it; hence to displace the name *ungava* as here used it will be necessary to show that the animal has an older name, that is, one published prior to October 30, 1889.

skinning): total length, 138; tail vertebræ, 31; hind foot, 19" (Merriam). Type of *P. celatus* " (from alcoholic specimen before skinning): total length about 130; tail vertebræ, 32; hind foot, 17.5" (Merriam). In adult male from Godbout, Quebec (topotype of *celatus*), in alcohol: total length, 137; tail vertebræ, 32; hind foot, 18. Ten adults from Hamilton Inlet, Labrador: average, total length, 151; tail vertebræ, 37; hind foot, 20; maximum, total length, 160; tail vertebræ, 44; hind foot, 21.

Specimens examined.—Total number, 19.

Labrador: Fort Chimo, Ungava, 1 (type); Hamilton Inlet, 16; Gros-water Bay, 2 (skulls).

Quebec: Godbout 4 (including type of *celatus*).

General remarks.—*Phenacomys ungava* is distinguished from *P. latimanus*, the only other known species with yellowish face, by its larger size and strongly ridged interorbital region. The specimens from Hamilton Inlet average considerably larger than the type of *P. ungava* or the two adults from Godbout, Quebec, but as they agree in all other characters it seems unwise to separate them on the basis of the material now at hand. This series shows individual variation sufficient to cover the supposed differences between *P. ungava* and *P. celatus*.

***Phenacomys longicaudus* True.**

Phenacomys longicaudus True, Proc. U. S. National Museum, XIII, p. 303, November 15, 1890.

Type locality.—Marshfield, Coos County, Oregon. Type in U. S. National Museum (young adult No. $\frac{129071}{25883}$).

Geographic distribution.—The species is at present known from two specimens only, the type and one from Meadows, Lane County, Oregon. It probably ranges throughout the densely forested coast district of Oregon.

General characters.—Size large; tail about 40 percent of total length; color rusty brown or drab.

Color.—Type (taken in August, 1890); head, back, and sides rusty brown, slightly duller along middle of back, the fur everywhere dark plumbeous at base and sprinkled with long blackish hairs, which, however, are not noticeable except on close examination; ventral surface rusty white, the plumbeous bases of the hairs showing through irregularly; tail unicolor, dark brown both above and below; feet dusky. The Lane County specimen (♀ No. $\frac{20649}{42621}$, U. S. National Museum, Biological Survey collection), taken on April 13, 1891, is wholly unlike the type in color. Head, back, and sides pale yellowish drab, the fur light bluish plumbeous at base and sprinkled with inconspicuous dark hairs; belly grayish white, the bluish bases of the hairs showing through irregularly; tail indistinctly bicolor, light slaty gray above and at tip, whitish mixed with gray below; feet silvery white.

Skull.—The skull of the type is in fragments, and that of the Lane County specimen cannot now be found, hence the cranial characters of *Phenacomys longicaudus* are at present unknown.

Teeth.—The teeth of *Phenacomys longicaudus* differ from those of the other species in the reduction in width of the inner triangles of the upper molars. This tendency is especially marked in the posterior inner triangles of the first and second teeth. In these the anterior face of the prism is nearly parallel with the anterior side of the second external re-entrant angle. The anterior transverse loop of the posterior upper molar is narrower than in other members of the genus and the terminal loop of the same tooth is considerably shortened. In the lower jaw the enamel pattern shows no characters beyond a general tendency to narrowness of all loops and triangles.

Measurements.—Type specimen “(from skin): total length, 148; tail vertebræ, 58; hind foot, 20.2” (True). Lane County specimen: total length, 165; tail vertebræ, 63; hind foot, 20.8 (from fresh specimen by the collector, A. Todd).

General remarks.—*Phenacomys longicaudus* differs so strikingly in proportions and color from all other members of the genus that it cannot be compared with any. Its appearance is unique among the voles, though faintly suggested by some of the Asiatic species of *Alticola*.

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